

REMARKS

The application has been amended and is believed to be in condition for allowance.

There are no formal matters pending.

Amendments to the Disclosure

Independent claim 80 is amended to more clearly recite the inventive features of the invention, based on former claim 81 and finds support in the specification and the drawing figures as originally filed (e.g., page 13, lines 12-28; page 14 line 30 to page 15 line 25).

The claims are further amended to address some minor issues as to clarity and antecedent basis.

No new matter is introduced by way of the foregoing amendments.

The claims as amended are all believed to be readable on the elected Group II, drawn to an apparatus, and further to the elected species Group A2 and Group B3, each as identified in the Office Action of December 6, 2010.

Substantive Issues - Section 103

The Official Action rejected claims 80-81, 85, 88, and 91 under 35 USC 103(a) as being unpatentable over Chen et al. (US 5,141,564, hereafter "CHEN"), in view of Regittnig (US Pub. 2001/0022992, hereafter "REGITTNIG").

The Official Action rejected claim 82 under 35 USC 103(a) as being unpatentable over CHEN and REGITTNIG, and

further in view of Yamazaki et al. (US Pub. 2002/0139303, hereafter "YAMAZAKI").

The Official Action rejected claims 83-84 and 90 under 35 USC 103(a) as being unpatentable over CHEN and REGITTNIG, and further in view of Nishitani et al. (US 5,633,033, hereafter "NISHITANI").

The Official Action rejected claim 87 under 35 USC 103(a) as being unpatentable over CHEN and REGITTNIG, and further in view of Bachmann et al. (US 4,121,238, hereafter "BACHMANN").

The Official Action rejected claim 92 under 35 USC 103(a) as being unpatentable over CHEN and REGITTNIG, and further in view of Kuchinski et al. (US 2005/0072461, hereafter "KUCHINSKI").

The Official Action rejected claims 93-94 under 35 USC 103(a) as being unpatentable over CHEN and REGITTNIG, and further in view of Beck et al. (US 2002/0106873, hereafter "BECK").

The Official Action rejected claim 89 under 35 USC 103(a) as being unpatentable over CHEN and REGITTNIG, and further in view of Lu (US 5,880,823, hereafter "LU").

The rejections are respectfully traversed.

The Official Action offers CHEN as teaching a deposition zone in a CIGS process chamber a quartz crystal controller for Se and an electron impact emission spectroscopy

evaporation rate controller for the Cu, Ga, and In. The Official Action contends that CHEN teaches that a composition gradient of these elements is derived through use of these sensors.

In the present amendment, however, claim 80 has been amended to more clearly recite that the detection device detects the elements of the CIGS film at each of the rows. The references applied by the Official Action do not teach or suggest at least one composition device that detects, in the CIGS, at each of the rows, respective amounts of the deposited elements. That is, detection of the respective amounts is performed when they are present in the CIGS. CHEN does not teach or suggest this.

Further, CHEN does not teach a controller connected to the at least one composition detection device adapted to adjust the evaporant fluxes in the respective rows in response to a detected variation in the CIGS of deposited amount of the corresponding element.

On the contrary, the quartz crystal controller and electron impact emission spectroscopy evaporation rate controller in CHEN are directed to measuring flux and, in response to the measured value, controlling an input parameter (e.g., the supply effect) to the evaporation sources in order to keep the fluxes from the evaporation sources at a predetermined value. If a variation is detected in the flux

due to (for instance) some kind of drift in the machinery, the controller would adjust the input parameter to get the flux back to the predetermined value regardless of the actual outcome of the CIGS layer.

Thus, the detection devices and controllers of CHEN and the claimed invention function differently and measure different things. The measurement of a flux from an evaporation source is not the same as detecting materials deposited as a film on a substrate.

Further, it is known in the field that flux measurements do not necessarily correlate with the respective amounts of deposited elements in the CIGS. These factors are, for example, i) the uncertainty that an evaporant that reaches the surface of the growing layer on the substrate actually sticks to and stay on the substrate, ii) any difference in the location of flux sensors and the substrate resulting in an uncertainty how much of the evaporant flux actually reaches the surface of the growing layer on the substrate, and iii) in the case of using a quartz crystal controller, an inherent uncertainty (i.e., a probability) that the evaporant reaching and sticking to the surface of the growing layer on the quartz crystal stick could be different than in the case of the surface of the growing layer on the substrate.

In contrast, amended claim 80 clearly recites that the evaporation fluxes are adjusted by the controller in

response to a detected variation in the CIGS of a deposited amount of the corresponding element in order to provide a CIGS layer of uniform composition of elements. The performance of a CIGS solar cell is very dependent of the uniform composition of elements in the CIGS layer, which is thereby ascertained by an in-line apparatus according to amended claim 80. This is not ascertained by merely measuring the flux at least because of the other factors described above.

The Official Action further offers BACHMANN as teaching a direct measurement of composition by x-ray fluorescence, citing (column 3, lines 18-43 of the reference). The Official Action contends, in responding to arguments previously presented, that the composition detection device or devices are for detecting in the CIGS the respective amounts of deposited elements would be obvious in view of BACHMANN.

However, BACHMANN does not discuss any solar cells with CIGS as an absorber, therefore BACHMANN is directed to non-analogous art (see *In re Klein*, 98 U.S.P.Q.2D (BNA) 1991, 647 F.3d 1343 (2010)) and a skilled person would not have looked to BACHMANN at all.

Further, even if the skilled person would have considered BACHMANN, the skilled person would not be provided with any reasonable motivation from BACHMANN to replace the flux measurements in CHEN by a composition detection device for detecting respective amounts of deposited elements in the

CIGS. On the contrary, BACHMANN teaches away from the present invention in that it reaffirms to the skilled person that flux measurements are perfectly sufficient in an evaporation process.

In particular, BACHMANN teaches depositing a window layer of indium tin oxide on polycrystalline InP by way of sputtering. In column 51, lines 40-44, BACHMANN discloses "The indium and tin oxide content of the amorphous indium tin oxide layer thus produced was determined by x-ray fluorescence and within experimental error was the same as the sputtering target.". This correlation between the content of the deposited layer and the sputtering target in a sputtering process would lead the skilled person using an evaporation process to believe that there is similar correlation between the flux and the composition in the deposited layer in an evaporation process.

Therefore, there would have been no incentive to replace the flux measurement by a composition detection device for detecting in the CIGS the respective amounts of deposited elements.

Further, BACHMANN does not teach anything about using x-ray fluorescence in the context of a process control. Changing to a sputtering target of a different content would not be considered to be an action of process control in a production apparatus.

It is therefore respectfully submitted that amended claim 80 is novel and non-obvious over the references applied by the Official Action. Accordingly, it is respectfully submitted that claim 80 is allowable over the references raised by the Official Action. It is also respectfully submitted that the claims depending from claim 80 are allowable at least for depending from a allowable parent claim.

Withdrawal of the rejections under Section 103 is thereby respectfully requested.

In addition, rejoinder of at least the withdrawn claims 95 and 96 is respectfully requested.

From the foregoing, it will be apparent that Applicants have fully responded to the July 27, 2011 Official Action and that the claims as presented are patentable. In view of this, Applicants respectfully request reconsideration of the claims, as presented, and their early passage to issue.

In order to expedite the prosecution of this case, the Examiner is invited to telephone the attorney for Applicants at the number provided below if the Examiner is of the opinion that further discussion of this case would be helpful in bringing the case to allowance.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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